CLAIMS

1. A vibratory gyrosensor comprising a supporting substrate, which has a circuit element mounted thereon and a wiring pattern having a plurality of lands disposed thereon; and a vibration element mounted on a surface of the supporting substrate,

wherein the vibration element includes

a base portion having a mounting surface provided with a plurality of terminals that are connected to the lands; and

a vibrator portion extending integrally from a side of the base portion in a cantilever manner and having a substrate-facing surface which is flush with the mounting surface of the base portion, the substrate-facing surface being provided with a first electrode layer, a piezoelectric layer stacked on the first electrode layer, and a second electrode layer stacked on the piezoelectric layer,

wherein the vibration element is mounted on the supporting substrate by joining the terminals to the lands with metallic projections disposed therebetween.

2. The vibratory gyrosensor according to Claim 1, wherein the metallic projections comprise gold bumps each provided on a corresponding one of the terminals, each gold bump being welded to the corresponding one of the lands.

3. The vibratory gyrosensor according to Claim 2, wherein

each gold bump comprises multi-tiered bump components.

4. The vibratory gyrosensor according to Claim 1, wherein the mounting surface of the base portion is provided with a dummy bump.

5. The vibratory gyrosensor according to Claim 1, wherein the vibrator portion has a top surface that is disposed at a lower level from a top surface of the base portion with a slope disposed therebetween, and

wherein the metallic projections are disposed in a region on the mounting surface, which corresponds to a region in which the slope is not provided.

6. The vibratory gyrosensor according to Claim 1, wherein the mounting surface of the base portion is provided with a groove which extends across a region between a base end of the vibrator portion and at least one of the terminals that is positioned proximate to the vibrator portion.

7. The vibratory gyrosensor according to Claim 6, wherein one end of the groove extends towards a side of the base portion.

8. The vibratory gyrosensor according to Claim 1, wherein the supporting substrate is provided with a recess in a region facing the substrate-facing surface of the vibrator portion, the recess providing a space in which the vibrator portion is allowed to vibrate freely in a thickness direction thereof.

9. The vibratory gyrosensor according to Claim 8, wherein the recess has a height that allows a displacement-damping rate of the vibrator portion to be maintained at a predetermined value against a damping effect of airflow produced in response to the vibration of the vibrator portion.

10. The vibratory gyrosensor according to Claim 1, wherein the supporting substrate has a plurality of the vibration elements mounted thereon in addition to the circuit element, the vibrator portions of the vibration elements being oriented in different axial directions from each other.

11. The vibratory gyrosensor according to Claim 10, wherein the circuit element comprises an IC component, the IC component being disposed in a main mounting region located in an intermediate section of a line that connects mounting regions of the plurality of vibration elements.

12. A vibratory gyrosensor comprising a supporting substrate, which has a circuit element mounted thereon and a wiring pattern having a plurality of lands disposed thereon; and a vibration element mounted on a surface of the supporting substrate,

wherein the vibration element includes

a base portion having a mounting surface provided with a plurality of terminals that are connected to the lands;

and

a vibrator portion extending integrally from a side of the base portion in a cantilever manner and having a substrate-facing surface which is flush with the mounting surface of the base portion, the substrate-facing surface being provided with a first electrode layer, a piezoelectric layer stacked on the first electrode layer, and a second electrode layer stacked on the piezoelectric layer,

wherein the vibration element is mounted on the supporting substrate by joining the terminals to the lands with metallic projections disposed therebetween, and

wherein the supporting substrate has a first main surface on which the vibration element and the circuit element are mounted, and a second main surface provided with a plurality of external connection terminals that are electrically connected to an external control substrate.

13. The vibratory gyrosensor according to Claim 12, wherein at least one of the first main surface and the second main surface of the supporting substrate is provided with a load buffering groove for buffering an external load.

14. The vibratory gyrosensor according to Claim 13, wherein the load buffering groove surrounds a mounting region of the vibration element.

15. The vibratory gyrosensor according to Claim 13, wherein the load buffering groove surrounds a mounting

region of the circuit element.

16. The vibratory gyrosensor according to Claim 13, wherein the load buffering groove has a depth of 100 μm or more.

17. The vibratory gyrosensor according to Claim 12, wherein the vibration element is disposed closer to an outer periphery of the supporting substrate than to regions in which the external connection terminals are provided.

18. The vibratory gyrosensor according to Claim 17, wherein the plurality of external connection terminals is arranged concyclically along a circle on the second main surface of the supporting substrate, the circle defining a main region in which each external connection terminal is disposed.

19. The vibratory gyrosensor according to Claim 12, wherein the plurality of external connection terminals is arranged concyclically along a circle on the second main surface of the supporting substrate, the circle defining a main region in which each external connection terminal is disposed, and wherein the vibration element is mounted in a region in which the external connection terminals arranged along the circle are not provided.

20. The vibratory gyrosensor according to Claim 12, wherein the first main surface of the supporting substrate is covered with a light-shielding cover.

21. The vibratory gyrosensor according to Claim 12, wherein the external connection terminals and the control substrate have a load buffering layer disposed therebetween.

22. The vibratory gyrosensor according to Claim 21, wherein the load buffering layer comprises an anisotropic conductive film.

23. The vibratory gyrosensor according to Claim 21, wherein the load buffering layer comprises a flexible wiring substrate disposed between the external connection terminals and the control substrate.